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Telephone: 29 94 007, 29 25 66 Telex: 841-5-24226

Digital Equipment GmbH
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Neue Weyerstr. 10
West Germany

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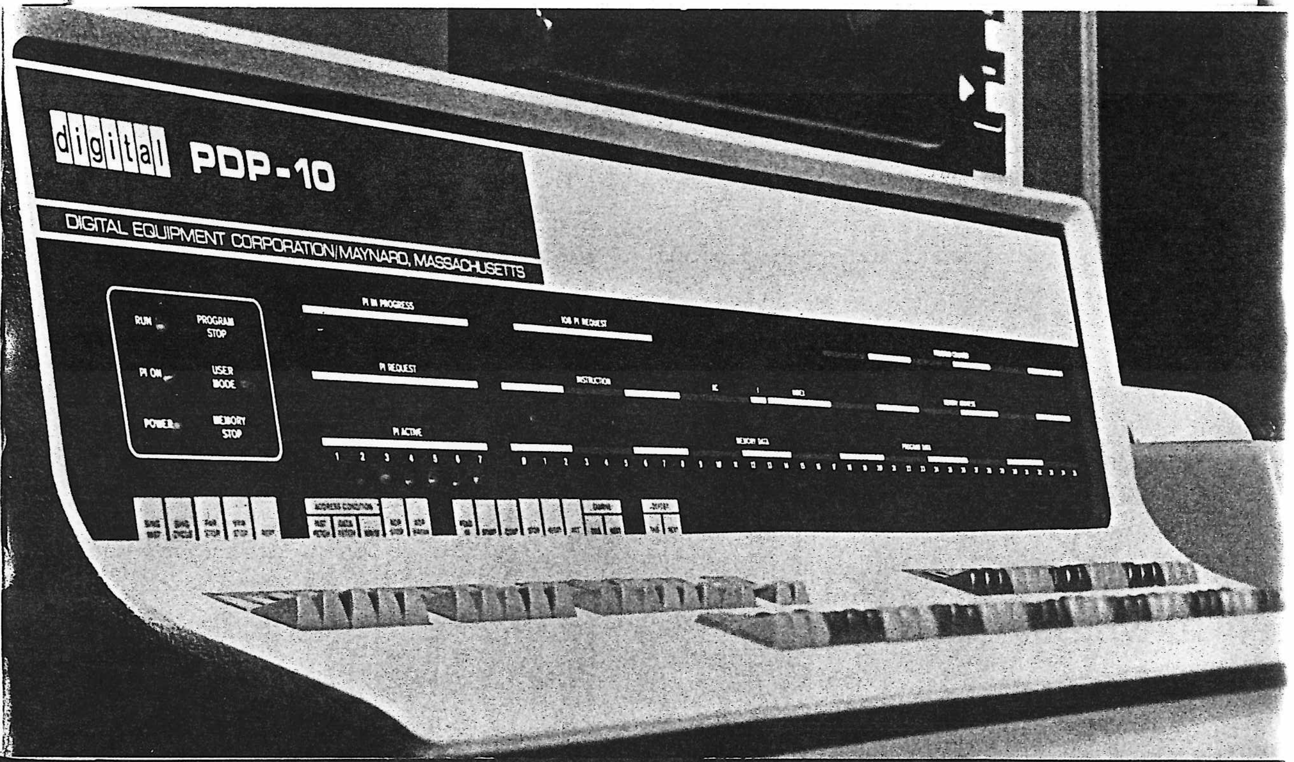

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SYSTEM SOFTWARE DESCRIPTIONS

The PDP-10 is a completely integrated hardware/software system that offers a realistic approach to time sharing. It combines field-proven software and modular, third generation hardware, with a low-cost threshold, easy expandability, and guaranteed system compatibility. PDP-10 time sharing systems can handle multiple jobs simultaneously — conversational time sharing, real time simulation and control, batch processing. And, PDP-10 is not just a paper tiger. Both hardware and software systems are being delivered today.

TIME SHARING SYSTEM SOFTWARE

PDP-10 time sharing software is console-oriented and device independent; i.e. device selection can be determined at run time. Both single user monitors and multiple access time sharing monitor systems can be used. Compilers and assemblers are compatible across monitor systems at both source and relocatable binary levels. The PDP-10's comprehensive software package also includes a debugging system (DDT), a text editor (TECO), a utility and file handler (PIP), and a relocatable linking loader (LOADER).

PDP-10's WIDE RANGE OF SOFTWARE INCLUDES:

EDITORS

- **Text Editor and Corrector (TECO)** — A powerful context editor with sophisticated macro facilities, and iterative string search, match, and substitute operations. TECO can be used to edit any file recorded in ASCII characters on any standard I/O device. TECO requires a minimum of 4K of core and uses additional core when available. In addition, at least one input and one output device are required.

- **DECtape Editor (EDITOR)** — An easy-to-use editor for generating and/or modifying sequentially numbered files recorded in ASCII characters on DECtape. EDITOR provides a direct means for generating Macro-10 and FORTRAN IV source programs (and other source language programs) directly from the Teletype for subsequent translation and modification. EDITOR requires 1K of core and one DECtape unit.

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CONVERSATIONAL LANGUAGE TRANSLATORS

- **Macro-10 Assembler (MACRO)** — A sophisticated 2-pass assembler with a flexible assembly language containing complete macro instruction facilities, many special data generating, conditional assembly, listing, and control pseudo-operations, and expanded address arithmetic. Also provides concatenation, nested literals, and other exotic features for advanced programming. MACRO requires a minimum of 5K of core, uses additional core if necessary, and utilizes one binary output device (if object coding output is desired), one listing output device (if any assembly listing is desired), and one or more input device(s).

- **FORTRAN IV Compiler (F40)** — A single-pass compiler which handles programs written in the standard ASA FORTRAN IV source language. Includes advanced features far exceeding the requirements for ASA FORTRAN x3.9 — 1965. Requires a minimum of 9K of core (10K for full continuation cards) to compile the complete FORTRAN IV language set; a special compiler version for handling a subset of the FORTRAN IV language requires 5.5K. Both use additional core when available and one (or more) input device(s), one binary output device (if subject coding output is desired), and one listing output device (if a compilation listing is desired).

PROGRAM LOADING AND LIBRARY FACILITIES

- **Linking Loader (LOADER)** — Loads and links independently assembled or compiled binary programs preparatory to execution. Special options include automatic library searching on any input medium, chaining facilities, and a storage map listing. Core occupied by the Loader is recoverable after loading. Requires a minimum of 2K of core and uses additional core as required. Utilizes a Teletype (for operator control), one or more input devices containing the binary programs to be loaded, one output device (if a storage map listing is desired), and one SYS-tems device containing any library files (optional).
- **FORTRAN Library (LIB40)** — Contains the FORTRAN IV Operating System and PDP-10 Science Library. Includes routines for performing all I/O operations and format conversions plus over 100 mathematic routines including double precision and complex functions, Dump, and chain facilities.
- **File Update Generator (FUDGE2)** — A library editing and updating system which allows the user to manipulate individual binary programs within a file. Requires a minimum of 2K of core, uses additional core (if available) to dynamically allocate its buffers to advantage, and utilizes two input devices (master file and transaction file) and one output device.

DEBUGGING

- **Dynamic Debugging Technique (DDT)** — Famous on-line debugging aid with more than 50 commands for conversational interaction with running programs. DDT can be used to debug any program, such as a Macro-10 or FORTRAN IV object program. User can stop program at dynamically chosen points, called breakpoints, and examine and modify instructions and data in a variety of modes including *symbolic*. DDT can also search through a program for a particular instruction, data value, or effective address (i.e., all references to a given core location). DDT requires 2K of core (plus whatever core is required by the programs being debugged) and a Teletype for operator control.

- **Cross-Reference Listing (CREF)** — A debugging aid which generates a sequentially numbered Macro assembly listing followed by one to three tables containing all cross references to (1) all operand-type symbols; (2) all user-defined operators; and (3) all op codes and pseudo-op codes. Input to CREF is a modified listing output produced by the Macro-10 Assembler. CREF requires a minimum of 2K of core (any available additional core is used if necessary), one input device containing the modified Macro assembly listing, and one output device for the CREF listing and cross-reference tables.

- **Global Symbol Cross-Reference Listing (GLOB)** — Reads multiple binary program files produced by the Macro-10 Assembler or FORTRAN IV Compiler and produces an alphabetic cross-reference listing of all global symbols encountered. GLOB requires a minimum of 2K of core (any available additional core is used if necessary), one or more input devices for the programs to be scanned, and one or more output devices.

UTILITIES

- **Peripheral Interchange Program (PIP)** — An on-line method of transferring files between standard I/O devices, thus eliminating the need for off-line conversion on a satellite computer. PIP also performs optional merging, editing, sequencing, and syntax checking. PIP requires a minimum of 3K of core (PIP1, a version containing a subset of PIP commands, requires 1K). An additional 1K of core is required if a disk is present in the system. All other available core is used for extra I/O buffers. PIP utilizes one or more input devices and one output device.

- **Code Translator (CODE)** — A routine which performs translation between ASCII code and codes of other manu-

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FRAP AND DECAL

facturers in the combinations shown below (or other combinations by inserting different translation tables).

ASCII to EBCDIC (9-track magnetic tape)
ASCII to BCD
EBCDIC to ASCII
BCD to ASCII

CODE requires a minimum of 2K of core (additional available core is used for extra I/O buffers) and one input plus one output device.

- **Source Compare (SRCCOM)** — Compares, line by line, two versions of an ASCII file and outputs any differences. SRCCOM requires a minimum of 3K of core (each additional 1K of core available increases look-ahead capability by 32 lines), two input devices, and one output listing device.
- **Binary Compare (BINCOM)** — Compares, word by word, two versions of a relocatable binary program file and outputs any differences. BINCOM requires a minimum of 1K — 2K of core, two input devices, and one output listing device.

CALCULATORS

- **Algebraic Interpretive Dialogue (AID)** — A conversational problem-solving algebraic calculator for scientists and engineers; based upon the famous RAND JOSS algebraic calculator.[1] AID requires 10K of core (allowing for 1K of user data area) and expands automatically to 13K (allowing for 4K of user data area) together with a Teletype and optional I/O devices.
- **Desk Calculator (DESK)** — A desk-type calculator which gives the user direct access to arithmetic functions. DESK utilizes familiar arithmetic operators and functions and, in addition, permits the user to define macro operations. DESK requires 3K of core, a Teletype, and optional I/O devices for storage of macro functions and intermediate results.

BATCH PROCESSING

- **Batch Processor (BATCH)** — A controller for supervising the sequential execution of a series of jobs with a minimum of operator attention. BATCH allows the operator at any time to interrupt, skip, repeat, or prematurely terminate one or more of the jobs in a series. In a time-sharing environment, BATCH operates concurrently with its controlled jobs as one of the "users" of the system. BATCH requires a minimum of 3K of core plus enough core for running the BATCH-controlled jobs, one input device, one scratch device, one output device, and one shared systems device.
- **Job Stacker (STACK)** — A processor for gathering inputs from specified devices and forming them into a suitable job stack for BATCH and taking outputs from a stack produced by BATCH and distributing them to specified devices, thus performing the role of a satellite computer. In a time-sharing environment, STACK permits the same computer to be used for (1) preparing an input stack for later input to BATCH; (2) BATCH-controlled job processing; and (3) distributing an output stack from a previous BATCH run — *all at the same time.* In addition, each of these three processes may be performed by several users simultaneously. STACK requires a minimum of 3K of core (additional available core is used for extra I/O buffers), a Teletype for control, one or more input devices, and one or more output devices.

MONITORS

- **System Builder (BUILD)** — Constructs a Monitor specialized for the user's particular machine configuration and other requirements, thus permitting the distribution of Monitor as a set of modular subprograms. BUILD employs an easy-to-use dialogue technique for requesting information from the operator. BUILD requires 2K of core plus the core required by the Monitor being built, and one DECtape unit for the BUILD file containing the modular subprograms.
- **10/40 Time-Sharing Monitor** — A proven multiprogramming time-sharing system containing such advanced features as run-time selection of I/O devices, automatic job-to-job transition, and job save-and-restore and memory dump facilities.
- **10/50 Time-Sharing Disk-Swapping Monitor** — A full-range, disk-swapping, time-sharing system incorporating all the features of the 10/40 Monitor with greatly extended capacity.

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[1] JOSS is the trademark and service mark of The RAND Corporation for its computer program and services using that program.

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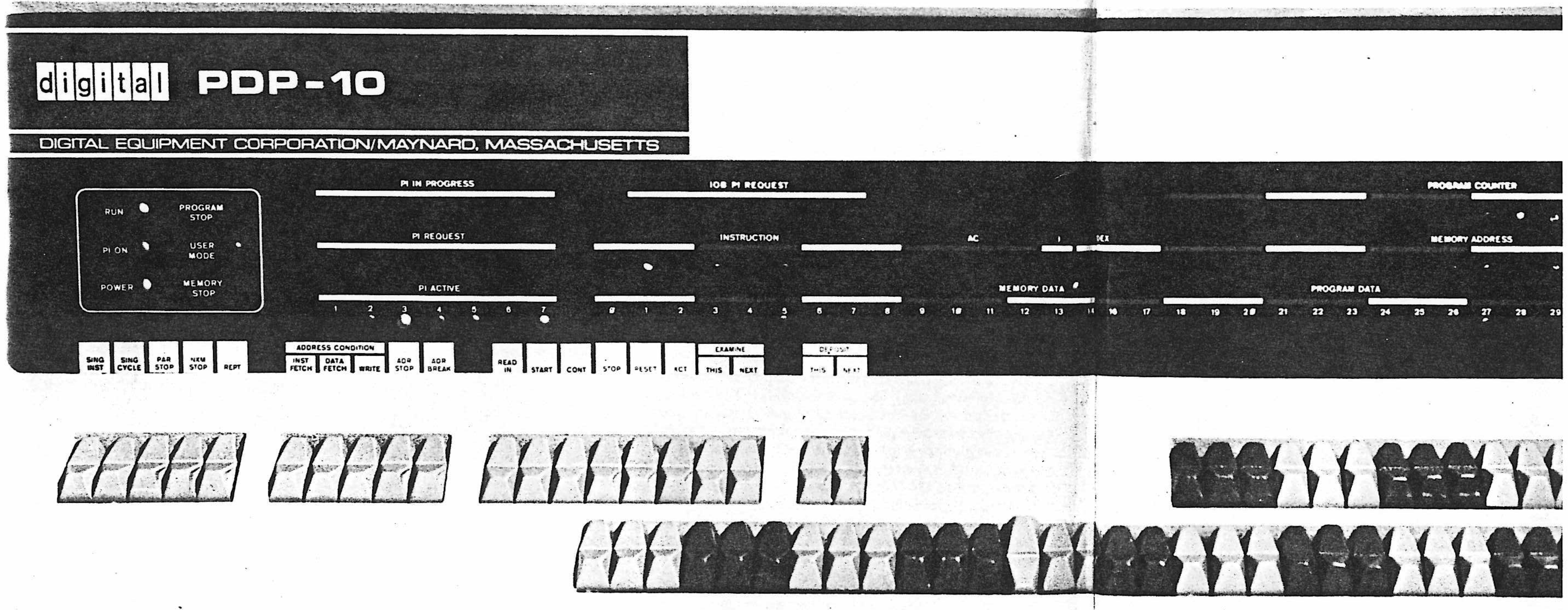

USING THE SYSTEM

Communicating with the Monitor and loading and executing Digital-supplied Common User Service Programs (CUSP's), as well as your own programs, is a simple matter once you become familiar with a few basic rules.

To establish communication with the Monitor, you must place your Teletype into the *Monitor command mode.* Generally, this is accomplished by typing ↑C (i.e., by holding down the CTRL key while striking "C"). Monitor responds with a period (.) and you can then direct Monitor to load and start a program from the System Library (.RUN prog), start a program already loaded in core (.START), discontinue your job (.KJOB), and many other operations.

All CUSP's supplied by Digital are *device independent*. Because of this, you must tell the CUSP, via a *command string* typein, which devices to use. Readiness to receive a command string is signalled by the CUSP via an asterisk (*) typeout after loading. For example, when you have called in the FORTRAN IV Compiler and it has responded with an

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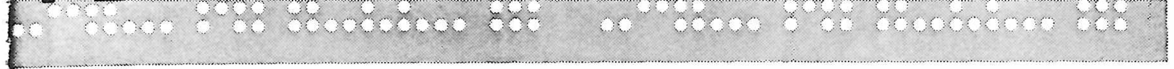

FRAP AND DECAL

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asterisk, you would type in a command string indicating (1) the device containing the source program to be compiled, (2) the device on which the binary output is to be placed, and (3) the device on which the compilation listing is to be written.

```
*binary-output-device, listing-device ←source-device
```

Devices are specified by a 3-character device name (a fourth character, a digit, specifies the particular unit in the case of DECtapes and magnetic tapes) followed by a colon.

Card reader	CDR:
Line printer	LPT:
Paper tape reader	PTR:
Paper tape punch	PTP:
Teletype	TTY:
DECtape	DTAn:
Magnetic tape	MTAn:
Disk	DSK:

For file-oriented devices (DECtape and disk), a *filename* is also required following the device name to specify either the specific file to be read or the filename to be assigned to the output. A filename can consist of a maximum of six characters. A filename can be further specialized by adding a 3-character *extension* name to it, preceded by a period (.). Extension names are generally used to classify a file into a particular category and certain standard extensions are used and recognized throughout the system (e.g., .REL for relocatable binary files, .DMP for saved core image files, etc.).

A sample FORTRAN command string might appear as follows.

```
DTA1:BIN.REL,LPT:←DTA0:SOURCE
```

Compile the file called "SOURCE" on DECtape 0; write the binary output on DECtape 1, calling it "BIN.REL"; print the listing on the line printer.

USER CONSOLE SESSION

The following console session demonstration is designed to illustrate the ease of operation and flexibility of the PDP-10 Time-Sharing System. Basically, this particular session involves the creation of a FORTRAN IV source program and a MACRO-10 subroutine, a FORTRAN compilation and MACRO assembly, the loading and linking of the two resultant binary programs, their execution and correction under control of the Dynamic Debugging Technique program, and the saving of the corrected programs for future executions.

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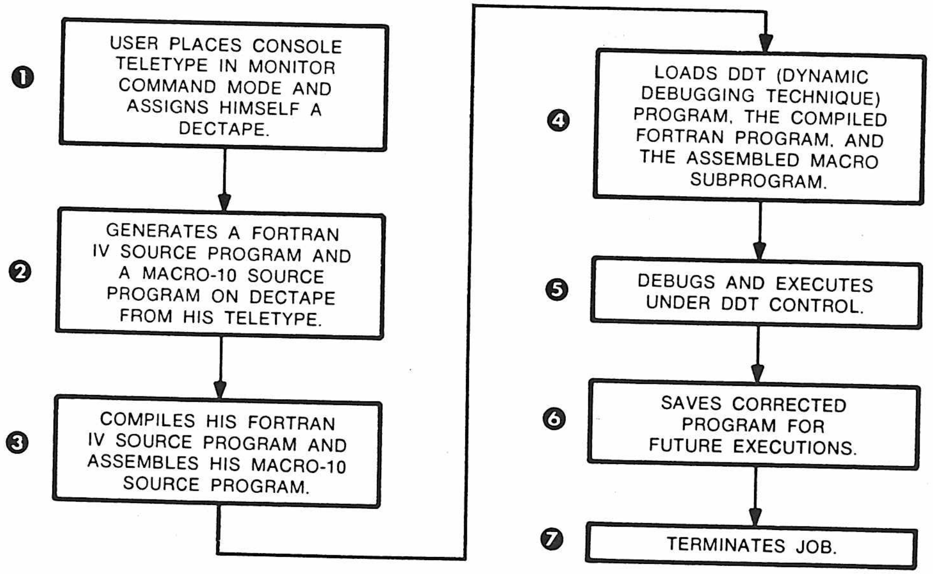
FRAP AND DECAL



❶
USER PLACES CONSOLE TELETYPE IN MONITOR COMMAND MODE AND ASSIGNS HIMSELF A DECTAPE.
❷
GENERATES A FORTRAN IV SOURCE PROGRAM AND A MACRO-10 SOURCE PROGRAM ON DECTAPE FROM HIS TELETYPE.
❸
COMPILES HIS FORTRAN IV SOURCE PROGRAM AND ASSEMBLES HIS MACRO-10 SOURCE PROGRAM.
❹
LOADS DDT (DYNAMIC DEBUGGING TECHNIQUE) PROGRAM, THE COMPILED FORTRAN PROGRAM, AND THE ASSEMBLED MACRO SUBPROGRAM.
❺
DEBUGS AND EXECUTES UNDER DDT CONTROL.
❻
SAVES CORRECTED PROGRAM FOR FUTURE EXECUTIONS.
❼
TERMINATES JOB.

FLOWCHART
REFERENCE
↓

$ = ALT MODE
↲ = CARRIAGE RETURN
UNDERSCORE = TYPED BY SYSTEM

❶
```
1     ↑C↲
```

Place Teletype in Monitor command mode so that you can type commands to Monitor.

```
2     .ASSIGN DTA1↲
      DTA1 ASSIGNED ↲
```

Assign DECtape 1 to your job. Monitor responds with message.

❷
```
3     .R TECO↲
```

Call in the Text Editor and Corrector program, which you will use to generate a FORTRAN IV source program and a Macro-10 source subroutine on DECtape from the Teletype.

```
4     *EWDTA1:MODULO $ $↲
```

TECO types an asterisk to request a command string from the user. Direct TECO to write the following FORTRAN source coding on DECtape 1 and call the file "MODULO". Two ALTMODE's ($$) terminate the command string.

```
5     *IC              ROUTINE TO TYPE IN TWO INTEGERS N1,N2↲
      C             AND TO TYPE OUT N1 MODULO N2.↲
      1             TYPE 5↲
      5             FORMAT (' TYPE N1 AND N2'//)↲
                    ACCEPT 10,N1,N2↲
      10            FORMAT (2I)↲
                    M=MOD(N1,N2)↲
                    TYPE 20,N1,N2,M↲
      20            FORMAT (I5, ' MOD' I5, ' IS' I5//)↲

                    GO TO 1↲
                    END↲
```

TECO responds with another asterisk. Now direct TECO to insert (I) the following source statements into its *command* buffer. type in the the complete FORTRAN IV source program.

```
6     $ $↲
```

When finished, type two ALTMODE's to transfer contents of command buffer to output buffer.

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FRAP AND DECAL

7
```
*PW$ $↙
```

Direct TECO to write output buffer contents on previously specified output device (DECTAPE 1).

8
```
*EF$ $↙
```

Direct TECO to terminate output file (write End of File on output device).

Your FORTRAN source program is now on DECtape 1 ready for compilation.

9
```
*EWDTA1:MACSUB$ $↙
```

Next, direct TECO to write the following Macro-10 source coding also on DECtape 1 and call the file "MACSUB".

10
```
*HK$ $↙
```

Clear TECO's command buffer.

11
```
*I ;MOD SUBROUTINE WITH STANDARD FORTRAN↙
;CALLING SEQUENCE:↙
;               FORTRAN STATEMENT↙
;                       M=MOD (N1,N2)↙
;RESULTS IN CALL TO MOD IN THE FORM↙
;               JSA     16,MOD↙
;               ARG     0,N1↙
;               ARG     0,N2↙
;THUS UPON ENTRY TO MOD, AC 16 POINTS TO N1↙
;THE REMAINDER OR "MOD" FUNCTION IS RETURNED IN AC 0 AS THE↙
;RESULT OF DIVIDING N1 (IN AC 17) BY N2.↙

ENTRY MOD                               ;ENTRY POINT FOR LOADER↙

MOD:    0
        MOVEM   17,SAV17    ;SAVE AC 17↙
        MOVE    17,@(16)    ;PICK UP N1↙
        IDIV    17,@(16)    ;DIVIDE BY N2 (REMAINDER IN AC 0)↙
        MOVE    17,SAV17    ;RESTORE AC 17↙
        JRA     16,2(16)    ;RETURN TO CALLING PROGRAM↙

SAV17:  0                   ;TEMP. FOR AC 17↙

        END↙
```

Direct TECO to insert (I) the following source statements into its command buffer. Type in the complete Macro-10 source program.

12
```
$ $↙
```

When finished, type two ALTMODE's to transfer contents of command buffer to output buffer.

13
```
*PW$ $↙
```

Direct TECO to write output buffer contents on previously specified output device (DECtape 1).

14
```
*EF$ $↙
```

Direct TECO to terminate output file.

Your Macro-10 source program is now on DECtape 1 ready for assembly.

15
```
*↑C↙
```

You have no further need for TECO; return to the Monitor command level to direct Monitor to load the next program.

16
```
.AS DTA↙
DTA5 ASSIGNED↙
```

Assign another DECtape (DECtape 5 is assigned by Monitor) to your job. You will be using this DECtape to store the binary output produced during the compilation and assembly which follow.

❸ 17
```
.R F40↙
```

Call in the FORTRAN IV Compiler (F40).

18
```
*DTA5:/Z MODULO,LPT: DTA1:MODULO↙
```

The Compiler responds with an asterisk to request a command string. Direct the Compiler to to compile the file called "MODULO" from DECtape 1, zero (/Z) the file directory on DECtape 5 and write the binary program output on it calling the file "MODULO" (the extension .REL is automatically appended to this name by the Compiler to identify it as a relocatable binary file), and print the compilation listing on the line printer.

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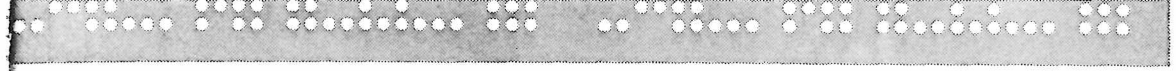

FRAP AND DECAL

19
```
*↑C↵
```

The Compiler responds with an asterisk when it has finished compilation. Since there are no more programs to compile, return to the Monitor command level.

20
```
.R MACRO↵
```

Call in the Macro-10 Assembler (MACRO).

21
```
*DTA5:MACSUB,LPT: DTA1:MACSUB↵
```

MACRO responds with an asterisk to request a command string. Direct MACRO to assemble the file called "MACSUB" from DECtape 1, write the binary output on DECtape 5 and call it "MACSUB" also (the extension .REL is automatically appended to this name by MACRO), and print the assembly listing on the line printer.

22
```
THERE ARE NO ERRORS↵
PROGRAM BREAK IS 000007↵
5K CORE USED↵
```

When assembly is completed, MACRO types out three messages: (1) the number of source language errors encountered; (2) the number of core locations required by the resultant binary program; and (3) the amount of core used during this assembly.

23
```
*↑C↵
```

When MACRO responds with an asterisk, return to the Monitor command level to load the next program.

❹ 24
```
.R LOADER 6↵
```

Call in the Linking Loader (LOADER) to load and execute the two programs.

25
```
*/D↵
```

Direct LOADER to load the Dynamic Debugging Technique (DDT) program for use in case either of your two programs contains errors. When you strike RETURN, LOADER loads DDT before responding with an asterisk.

26
```
*DTA5:MODULO,MACSUB↵
```

Direct LOADER to load your two binary program files, MODULO and MACSUB (the extension .REL is assumed for both filenames) from DECtape 5. When you strike RETURN, LOADER loads both programs before responding with an asterisk.

27
```
*(ALTMODE)↵
```

Type ALTMODE to terminate the LOADER.

28
```
LOADER↵
EXIT↵
↑C↵
```

LOADER signals that it is finished and automatically returns to Monitor command mode. At this point, the two programs are ready to be executed.

❺ 29
```
.START↵
```

Direct Monitor to begin execution of the programs.

30
```
TYPE N1 AND N2↵
```

Your FORTRAN program types a message requesting you to type in two values; the first number typed is to be reduced by the modulo indicated by the second number.

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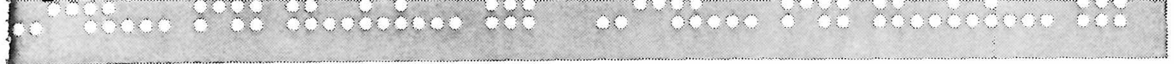

FRAP AND DECAL

31
```
10 4↵
    10 MOD     4 IS     0↵
```

Type in two numbers, 10 and 4. Your program types out the result that 10, reduced by modulo 4, is 0. This result is obviously incorrect.

32
```
TYPE N1 AND N2↵
```

Your program requests two more values.

33
```
↑C↵
```

At this point, exit to the Monitor command mode to enter DDT.

34
```
.DDT↵
```

Direct Monitor to enter DDT. DDT is entered and a halt occurs to allow you to set breakpoints and/or make modifications to your program before starting execution. DDT responds with two carriage returns when ready.

35
```
.MAIN$:↵
    MOD+3/   IDIV 17,@0(16)   IDIV 17,@1(16)↵
```

By looking at your assembly listing, you discover that the incorrect results are caused by your omission of a "1" in the source language statement located at MOD+3.

Specify to DDT the name of the program to be examined and corrected (.MAIN was automatically assigned by MACRO since no name was specified).

Type the address of the location you wish to examine (MOD+3). DDT types back the contents of the location *in symbolic*. You can now correct these contents, *in symbolic*, by typing the new contents desired.

36
```
$G↵
```

Type $G to restart your program execution.

37
```
TYPE N1 AND N2↵
10 4↵
  10 MOD     4 IS     2↵
TYPE N1 AND N2↵
12 3↵
  12 MOD     3 IS     0↵
TYPE N1 AND N2↵
```

Respond to typeouts as shown. Results now appear to be correct.

38
```
↑C↵
```

When you have obtained as many results as you desire, return to the Monitor.

⑥ 39
```
.SAVE DTA5 MODUL1↵
```

Direct Monitor to SAVE the core image of your corrected programs on DECtape 5 and call the core image file "MODUL1" (the extension .DMP is automatically appended to this name by Monitor).

40
```
JOB SAVED↵
↑C↵
```

Monitor responds with the message "JOB SAVED" when done. Whenever you wish to run your programs again, you can call and execute them by typing .RUN DTA5 MODUL1 at the Monitor command level.

⑦ 41
```
.KJOB↵
```

Kill your job. This releases any core that you might still have and releases any assigned devices (in this case, DECtapes 1 and 5) to the Monitor pool.

42
```
8.98↵
8.98↵
```

Monitor responds with the total computer time used by your job.

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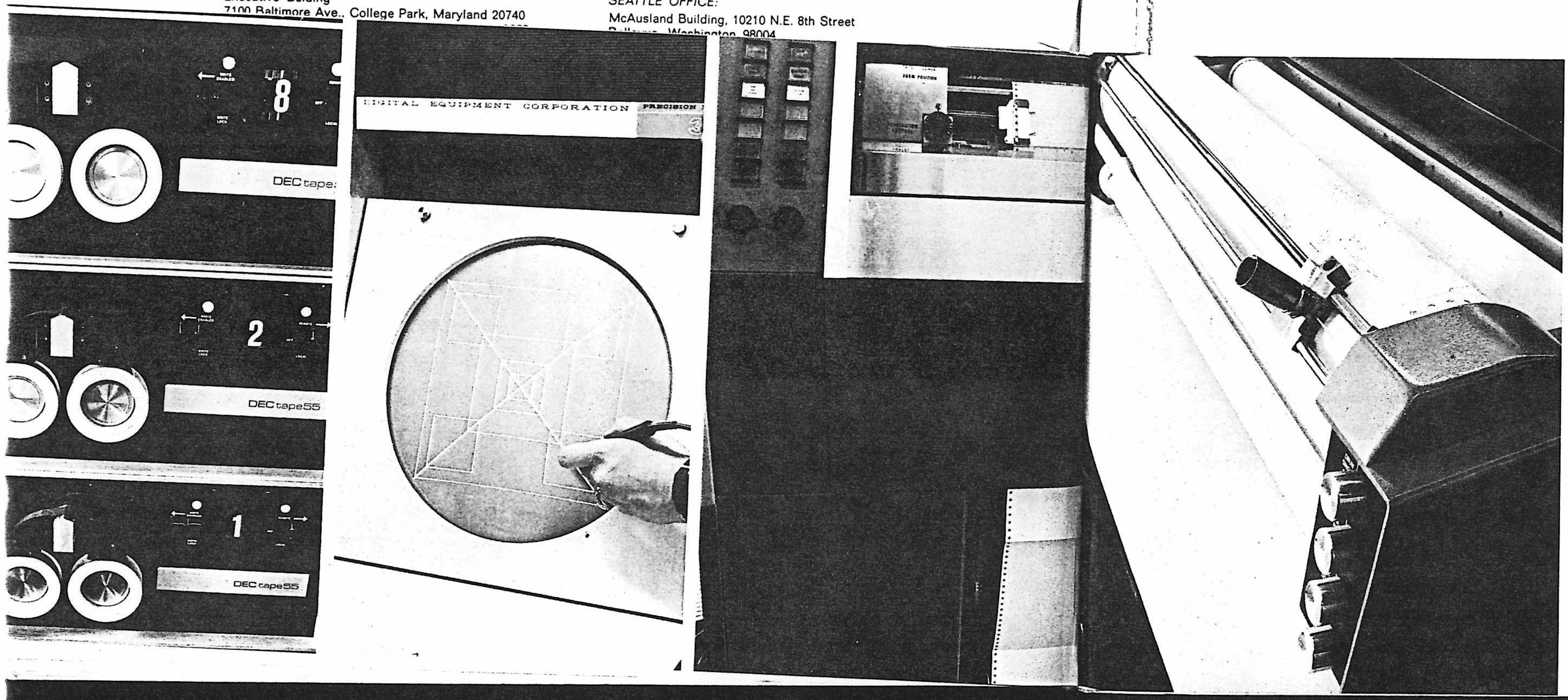

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KA10 Arithmetic Processor: for all PDP-10 Systems. Included with the basic processor are the following:

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- 50 cps paper tape punch
- 10 cps console teleprinter
- a functional Attached Operator Console having many advanced features
- a multiplexed Input-output Processor with seven levels of priority interrupt
- real time clock, 16.6 msec resolution

Central Processor Options

KM10 Fast Register Option: consists of 16 36-bit integrated circuit registers used as accumulators, index registers, or as the first 16 locations in core memory. Fast Registers have 210 nanosecond access time. Instructions may be executed from the fast registers.

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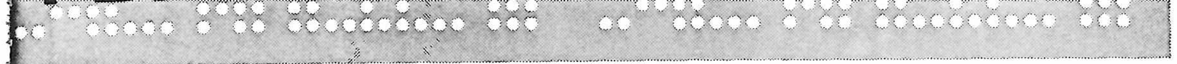

FRAP AND DECAL

KT10 Memory Protection & Relocation: allows executive/user mode operation, permitting the executive routine to assign 1024 word blocks of storage to a user. The Protection feature prevents the user from accessing storage assigned to other users.

KE10 Extended Order Code: implements 40 additional hardware instructions: 35 floating point, and 5 byte-manipulation instructions. Floating point format is 1-bit sign, 8-bit exponent, and 27-bit fraction. Included are one- and two-word result instructions to facilitate Multiple-Precision floating point and the Immediate Mode floating ADD, SUB, MUL & DIV.

MA10, MA10A, MB10 Core Memory Modules: MA10 stores up to 16,384 36-bit words; MA10A stores up to 8,192 36-bit words. Both have a complete cycle time of 1.0 μs. MB10 stores up to 16,384 36-bit words at a cycle time of 1.65 μs. Each individual memory module operates asynchronous with respect to the central processor. Memory modules have three modes of operation: read mode, write mode, and read-pause-write mode. A Memory-Processor Bus connects each memory to a processor via one of four memory ports. Up to four processors can access any one memory. All core memory locations contain 36 data bits and one bit for parity checking. The central processor can directly address 262,144 words of main memory.

MC10 Additional Memory-Processor Access: The MC10 provides the necessary cables and connectors for opening additional memory ports. Interconnections for one memory port are provided for the central processor with the purchase of any PDP-10 system. One MC10 is required for each of the remaining three memory ports that is to be activated.

DF10 Data Channel: permits data transfers between external devices and the PDP-10 memory without KA10 processor intervention. The channel is an I/O processor which allows block transfers, scatter transfers, and jump-type operations. It is capable of servicing up to eight external devices.

RC10 Disc Synchronizer/Adapter: device control for the RD10 Disc File. The RC10 connects to the I/O Bus to obtain control information and to the Data Channel which establishes the data path to/from core memory.

RD10 Disc File: contains 200 tracks, each with 80 usuable segments of 32 words. (Each unit contains 512,000 36-bit words.) Average access time is 17 milliseconds and maximum is 34 milliseconds. Transfer rate, after latency time has elapsed, is 13.3 usec per word, 76,000 words/second. Transfers go through the Disc Synchronizer/Adapter, RC10, at 2,700,000 bits/second.

CR10 Card Reader: reads standard 80-column punched cards at the rate of up to 1000 cards per minute. The reader is a table-top unit provided with a free-standing table. The card reader control is housed with the LP10 Line Printer and XY10 Plotter Control in a separate 19-in. cabinet. The control connects to the I/O bus.

LP10A Line Printer: has a 64-character font and prints 132-column lines up to 300 lines per minute. LP10B has the same characteristics but prints up to 600 lines per minute. Both use the new PDP-10 modified USASCII code.

TM10 Magnetic Tape Control: for the TU20 (36KC) and TU79 (60KC) Tape Transports. It can control up to a total of eight transports, all 36KC, all 60KC, or a mix of both. The transports can be either seven or nine channel or mixes of both.

TU20 Magnetic Tape Transport: reads or writes at the rate of 36,000 characters per second. Recording densities of 200, 556, or 800 bits-per-inch may be selected, at a tape speed of 45 in. per second. Seven or nine channel half-inch industry standard (IBM compatible) tape is used.

TD10 DECtape Control System: operates up to eight TU55 DECtape Transports. It is housed in a 19" cabinet, bolted to the console side of KA10, and has space for up to 3 TU55's. The control is complete with a power supply system, ac and dc wiring, I/O bus cables, and ac outlet for TU55's.

TD10 may consist of a TD10A DECtape Control and up to 5 TU55 Transports, or it may consist of a TD10A Control plus a TD10B Extender Cabinet with 6 to 8 TU55 DECtape Transports.

TU55 DECtape Transport: a fixed-address magnetic tape storage system which provides random access for high-speed reading or writing of files on a 3½" diameter, 260-foot reel of ¾ in. magnetic tape. Each DECtape reel holds up to 2.7 million bits.

DC10 Data Line Scanner: provides on-line servicing of up to 64 communication lines. Accommodates any device which uses 5-level or 8-level serial teletype code at speeds up to 100 kilobaud. Full duplex with local copy, and half duplex (simplex) data line modes are available on each line serviced. Send-only and receive-only stations can also be used.

DC10A Control Unit: the scanner and central control unit for the DC10 series. It provides cabinet space and power supplies for various combinations of line equipment up to 32 lines maximum. For more than a 32-line operation, an additional 32 spaces are provided in DC10F Expander Cabinet.

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DC10B 8-line Group Unit: Provides teletype interfaces for up to 8 local lines, full or half-duplex. It is housed in DC10A or DC10F.

DC10C 8-line Telegraph Relay Assembly: provides conversion from local to long lines and has half-duplex facilities. Housed in DC10A or DC10F.

DC10D Telegraph Power Supply: the standard line-voltage supply used with DC10C. Housed in DC10A or DC10F.

DC10E Expanded Dataset Control: provides expanded control of eight data-sets in the DC10C system, and controls two automatic dialling units (if dial-units are part of system). Housed in DC10A or DC10F.

DC10F Expander Cabinet: provides space and power supplies for expansion beyond capacity of DC10A.

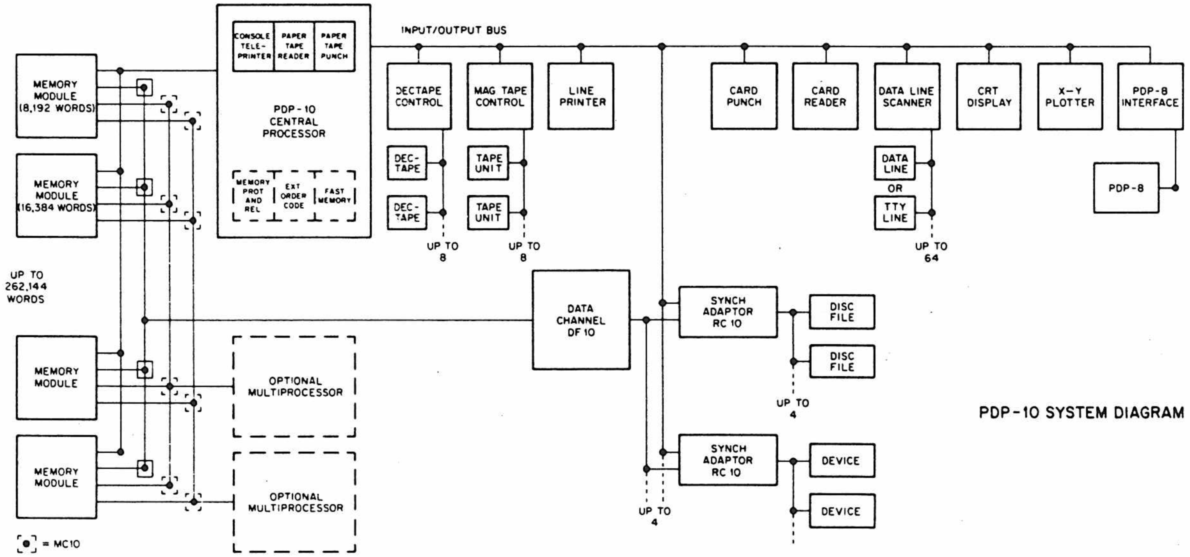
346/340 Precision Incremental Display: a system for converting digital data into points, straight lines, and curves at high speed. An optional feature permits the generation of alphanumeric characters. The 346/340 accepts digital data from the PDP-10 computer in the form of commands and scope face locations, of which there are 1024 by 1024 in the 9⅜ inch square display area. Spot size is approximately .015 inch. A 370 Light Pen may be connected as an optional extra. The 346/340 is housed in two side-by-side 19" cabinets.

348/VR30 Precision Incremental Display: a low-cost, compact point plotting display with the same precision of larger DEC displays. It operates at a maximum plotting rate of 20 KHz, or one point every 50 μsec on a 9⅜" X 9⅜" display area. Number of addressable points along each axis is 1024. A 370 high-speed light pen may be connected as an optional extra. 348/VR30 is housed in a 19" free-standing cabinet.

XY10 Incremental Plotter: interfaces Calcomp 500-series Digital incremental plotters to the PDP-10 I/O bus. The XY10 plotter control can be housed in the same cabinet as the CR10 card reader control and the LP10 line printer control. The control accommodates Calcomp Models 565, 563, 502, and 518 (not supplied). These plotters provide plotting surfaces from 11 x 120 inches to 54 x 72 inches, with resolutions from 0.010 inches to 0.002 inches per step.

DA10 PDP-8/PDP-9 Interface: Connects either a PDP-8 or PDP-9 computer to the PDP-10 I/O BUS. Two 36-bit buffers are provided for simultaneous bidirectional transfers. Housed in a 19" cabinet.

NOTE: Please inquire about additional peripheral equipment that could not be included at the time of publication. They include moving head mass storage units, message concentrators, A/D and D/A equipment, and high speed magnetic tape equipment.



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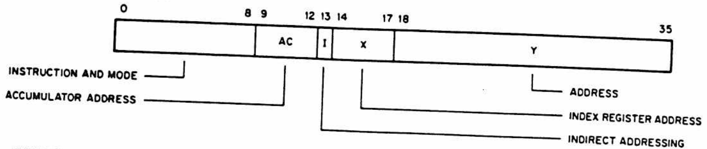
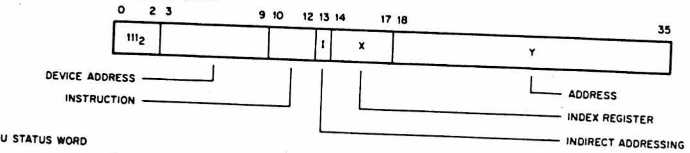
FRAP AND DECAL

DATA WORD FORMATS

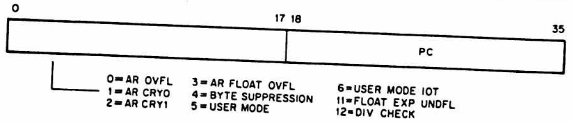
BASIC INSTRUCTION FORMAT



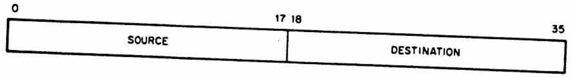
INPUT/OUTPUT INSTRUCTION FORMAT



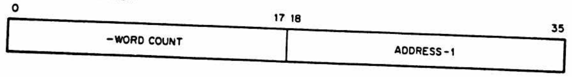
CPU STATUS WORD



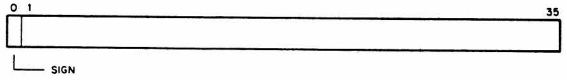
BLT CONTROL



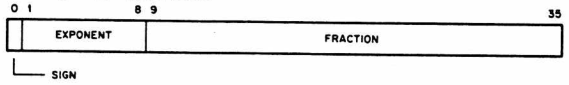
IOT CONTROL WORD, PUSH DOWN POINTER



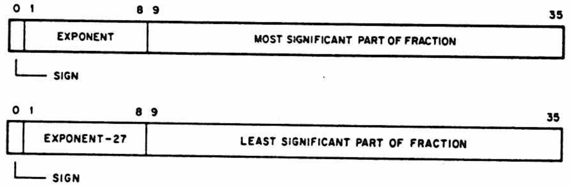
FIXED-POINT ARITHMETIC OPERANDS



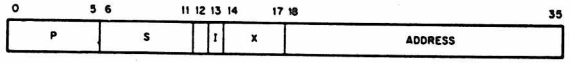
FLOATING POINT OPERANDS, SINGLE PRECISION FORMAT



FLOATING POINT OPERANDS, DOUBLE PRECISION FORMAT


0 1
8 9
35
EXPONENT
MOST SIGNIFICANT PART OF FRACTION
SIGN
0 1
8 9
35
EXPONENT-27
LEAST SIGNIFICANT PART OF FRACTION
SIGN

BYTE POINTER



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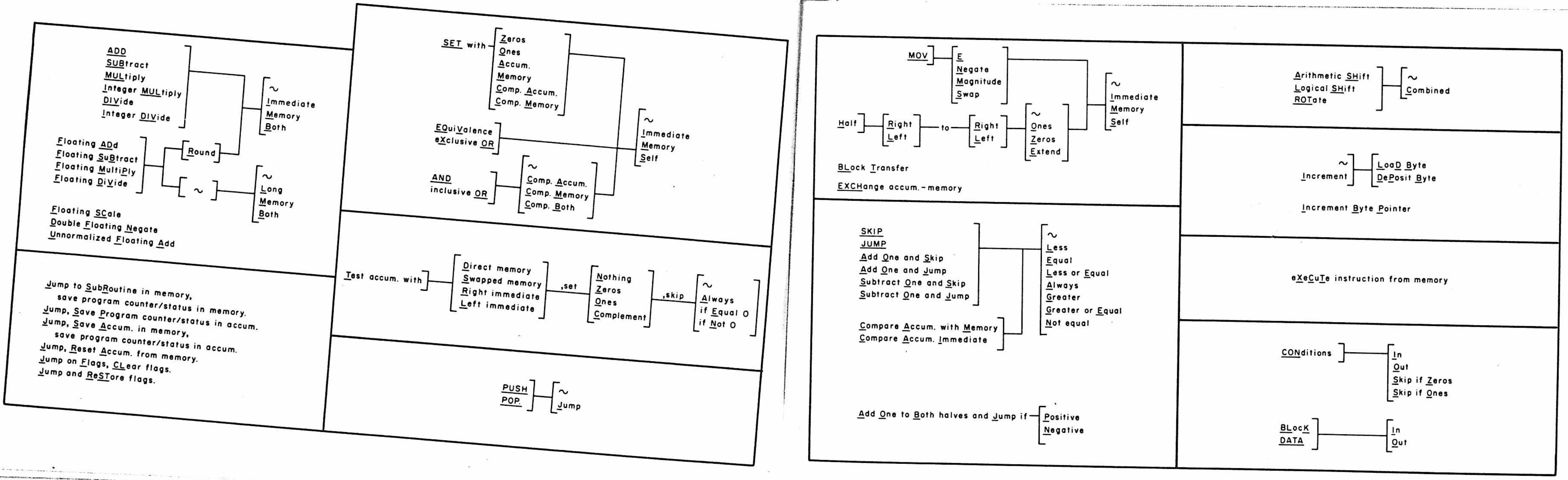

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